UNITED STATES MARINE CORPS

LESSON PLAN

AIR MASS CLASSIFICATION

INTRODUCTION:

1. Gain Attention. An air mass is an extremely large body of air that has uniform moisture, and temperature characteristics throughout. There may be minor variations near the earth surface. Air masses may cover many thousands of square miles. They are classified by their source region, or place or origin. There are four basic classifications of air masses based on source regions, and further classifications that result from an air mass moving away from its source region. These air masses are what create climates that have constant trends and characteristics throughout the world.

2. Overview. During this period of instruction, the student(s) shall be introduced to the current classification system used to identify the various air masses.

3. Introduce Learning Objectives.

a. Terminal Learning Objective. Without the aid of references, but in accordance with the instruction, the student(s) shall verbally state and describe each air mass classification.

b. Enabling Learning Objective(s). Without the aid of references, but in accordance with the instruction, the student(s) shall:

(1) State the six (6) air masses classifications.

(2) State the location of each respective source region and properties for each air mass classification.

4. Method/Media. This period of instruction will be taught using the lecture method with the aid of a Macromedia Flash presentation "QMMPH1-Introduction to the Earth's Dynamics".

5. Evaluation. The student(s) shall not be evaluated at the conclusion of this period of instruction.

TRANSITION. Recall from previous discussions that air masses are derived from respective source regions and that they vary from location to location. The next topic of discussion focuses on the identification system in place used to classify different air masses.

BODY:

1. Classifying Air Masses. Air masses are classified based on the source region that they are created from. The latitude of the source region directly correlates to the temperature of the air mass and the nature of the surface directly correlates to the humidity content. There are six (6) different classifications that are commonly used. They are Artic (A) (also commonly referred to as Continental Artic –

cA), Continental Polar (cP) and Continental Tropical (cT), Maritime Polar (mP) and Maritime Tropical (mT), and Equatorial (E). The following discussion relates to the different air masses that affect the continental United States.

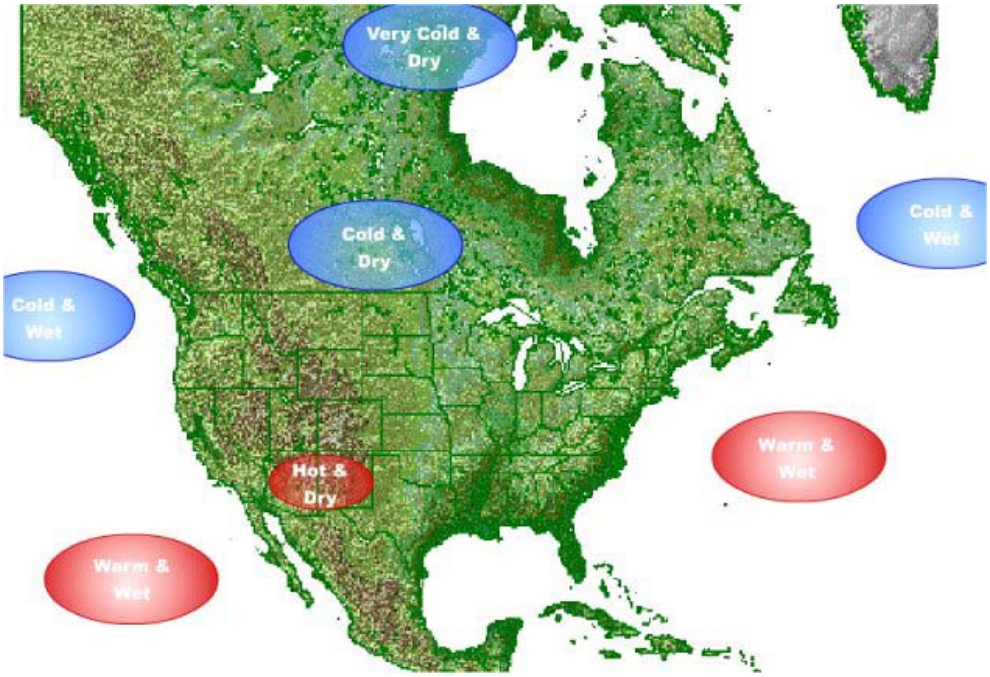

Figure 1 - Temperature and moisture characteristics of air masses.

a. Continental Polar and Artic Air Masses. Continental Polar and Artic air masses cold and dry. During the winter, both these air masses are bitterly cold and extremely dry. Due to the low amount of solar radiation at this time of the year, the nights are long and the days are short-lived with the Sun low on the horizon. This causes the Earth's surface and atmosphere to lose heat that is not replenished by the Sun and allows for the thermometer to drop to very cold temperatures. With very cold, dense air, comes a very strong inversion that traps the cold air and produces a very stable environment.

(1) Artic air masses are separated from continental polar air masses by the generally lower temperatures. Although, differences may be slight at times. Artic air forms over the Artic basin and Greenland polar ice cap. Even though much of this area is dominated by the Arctic Ocean, it is frozen year round and acts like a landmass, hence "continental".

(2) Continental polar air forms over the snow covered interior regions of Canada and Alaska, pole ward of 50 degrees north.

(3) Arctic air masses are prevalent during the winter months, but rarely are seen in southern Canada and the United States in the summer months. Because of the seasonal changes in solar elevation, the characteristics of continental polar

air masses do change in the warmer months, but they are still relatively cooler, drier and more stable than more southern air masses. During the summer, the rays of the Sun are located at a higher latitude allowing the northern areas of the United States and southern to central Canada to warm at the surface which in turn modifies the properties of these air masses.

b. Maritime Polar Air Masses. These air masses form over the oceans at high latitudes. Maritime polar air is cool to cold and humid. Compared to Artic and continental polar air masses, maritime polar is relatively milder in the winter because of the higher temperatures of the ocean contrast to the colder temperatures of the continents. There are two (2) regions of significance concerning maritime polar air masses that affect North America, the North Pacific and the North Atlantic.

(1) The North Pacific air masses have a more profound affect on North America due to the general west to east wind flow in the atmosphere. Air masses in the Northern Atlantic generally move towards Europe.

(2) The main influence from the North Pacific air mass dominates the western coast of North America in the wintertime.

c. Maritime Tropical Air Masses. Maritime Tropical air masses are warm to hot, humid and mostly unstable. These air masses are significant to the weather of a region because of the instability, and therefore precipitation, that accompany them.

(1) The tropical Pacific Ocean, Gulf of Mexico, Caribbean Sea or the adjacent Atlantic waters are the primary locations for maritime tropical air masses that affect mostly the United States.

(2) The Gulf, Caribbean Sean and Atlantic maritime tropical air masses are significant to the area east of the Rocky Mountains. Because of the location of the high pressure system, the southeastern United States is located in the southwestern quadrant of the air masses where the most instability is located.

Figure 2 - Air mass locations.

d. Continental Tropical Air Masses. Continental tropical air masses are hot and dry and found in extensive desert regions. Only in the summer does the southwestern United States experience this air mass. Even though it is caused by intense surface heating that produces an unstable environment and convective turbulence, the humidity content is so low that precipitation is rare.

e. Equatorial Air Masses. This air mass is found directly along the Equator and is associated with hot and humid air and extreme instability.

Table 1 - Characteristics of Air Masses.

Type	Code	Source Region	Source Region Properties
Artic	A	Antarctica, Artic Ocean & Basin, Greenland Ice Cap	Very Cold, Dry, Stable
Continental Polar	cP	High latitude Plains of Eurasia and North America	Cold, Dry, Very Stable
Maritime Polar	mP	Northern Oceans 50-60°Latitude	Cold, Moist, Relatively Unstable
Continental Tropical	cT	Low-Latitude Deserts	Hot, Very Dry, & Unstable
Maritime Tropical	mT	Tropical and Subtropical Oceans	Warm, Moist and Variable Stability
Equatorial	E	Oceans Near the Equator	Warm, Very Moist, & Unstable

OPPORTUNITY FOR QUESTIONS:

1. Questions from the Class. At this time are there any questions pertaining to the content that has just been introduced?

2. Questions to the Class. There are no questions for the student(s) at this time.

SUMMARY: During this period of instruction, the student(s) were introduced to the different classifications used to identify different air masses. A brief introduction to the various air masses that affect North America was also provided.

REFERENCE:

Ahrens, Donald C. Meteorology Today. 4th Edition. West Publishing Company, 1991.

Lutgens, Frederick K. and Tarbuck, Edward J. The Atmosphere, An Introduction to Meteorology. 9th edition. Pearson Education Inc, 2004.

McKnight, Tom L. and Hess, Darrel. Physical Geography, A landscape Appreciation. 7th Edition. Pearson Education, Inc. 2004.